

Research Topics for Doctorate in Neuroscience, curriculum in Neuroscience and Neurotechnologies

Research Topics

1. Deciphering the novel principles of the octopus motor control system 1
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1. Deciphering the novel principles of the octopus motor control system

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Research Line

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Description

The octopus is an outstanding example of complex multi-functional behavior in a soft bodied animal. With its long, flexible arms and highly developed brain, the octopus is able to perform a wide range of stereotypical motions and has been an excellent source of inspiration for soft robots at least for the last 10 years. Still, there are some unresolved issues, such as the motor control mechanisms, that dramatically interfere with translating the features of this unique flexible body into an artificial robotic model. Some of these basic issues are how the brain governs the arms, what type of information it sends and how it is being decoded to translate into highly effective movements along the flexible arms. In this project, we aim at deciphering the neural organization of the arm motor control using a bottom-up approach. With techniques of neural tracing and confocal microscopy we will define the architecture of the neural network controlling the arm muscles. We will next employ in vivo brain recordings, muscle electrophysiology and biomechanics techniques coupled with EMG and sonomicrometry to measure arm muscles activation and deformation during motions.

We aim at deciphering the main set of motor control strategy employed by the animal to perform stereotypical actions. This will provide low and high level requirements, from the mechanical and control aspects, for the construction of flexible embodied robotic arms.

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